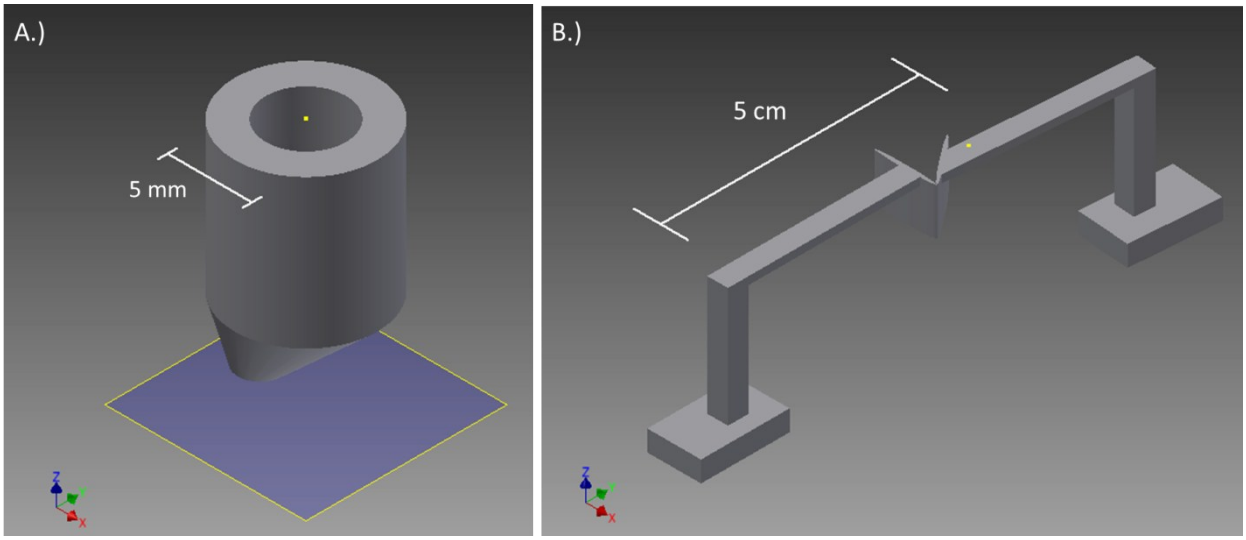
Electronic Supplementary Material (ESI) for Analytical Methods.

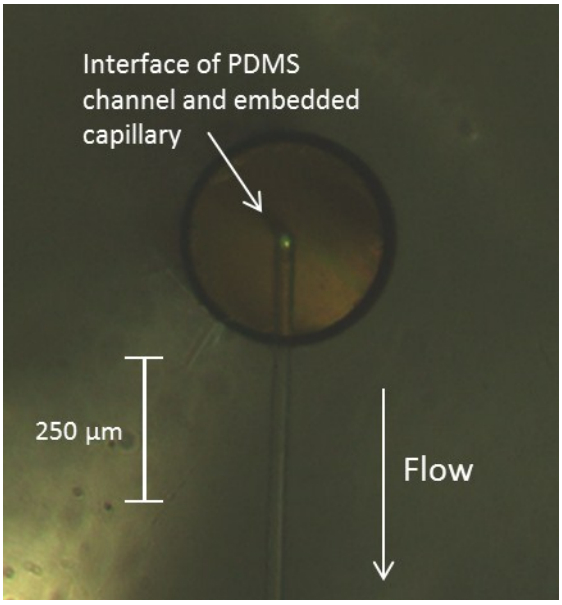
Supplemental Information for: ***Enhanced Microchip Electrophoresis Separations Combined with Electrochemical Detection Utilizing a Capillary Embedded in Polystyrene***

Figure S-1.



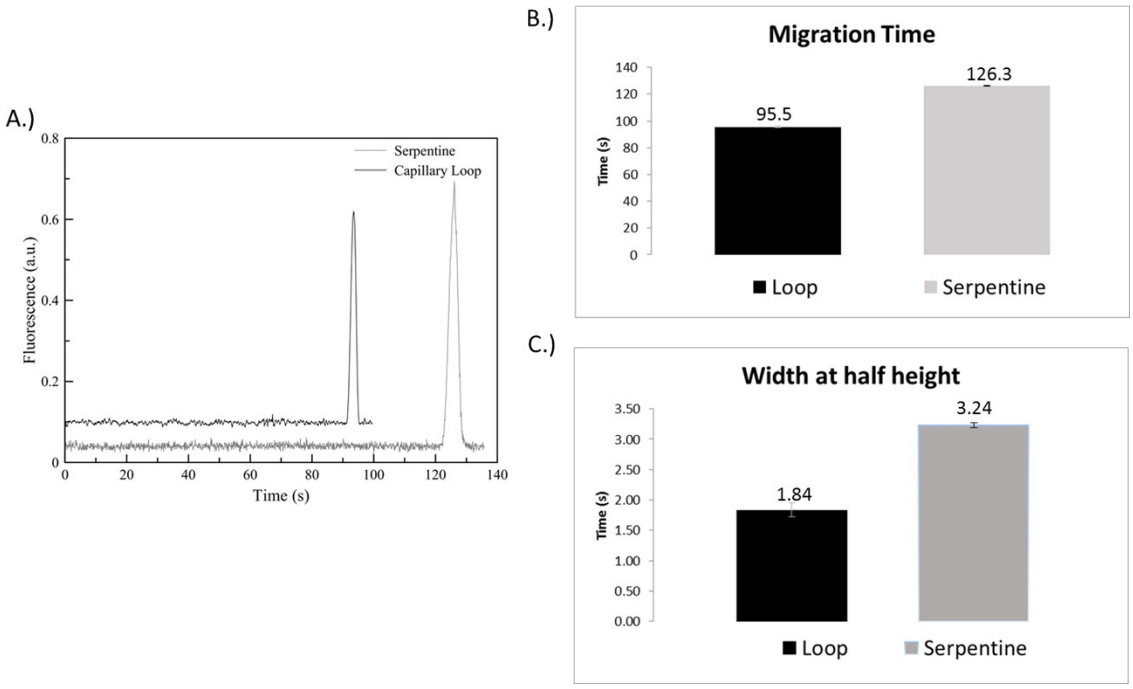
Schematics of the A.) syringe attachment for unclogging the capillary loop and B.) the clip for applying pressure onto the PDMS microchip to prevent delamination. The parts were designed with AutoDesk Inventor 2015 software and printed with Stratasys MOJO Desktop 3D printer. The syringe attachment is adhered to a vacuum luer with a vacuum cup attached before use with a syringe. When put together, the device is used to clean the capillary and prep it before use at the beginning of each day.

Figure S-2.



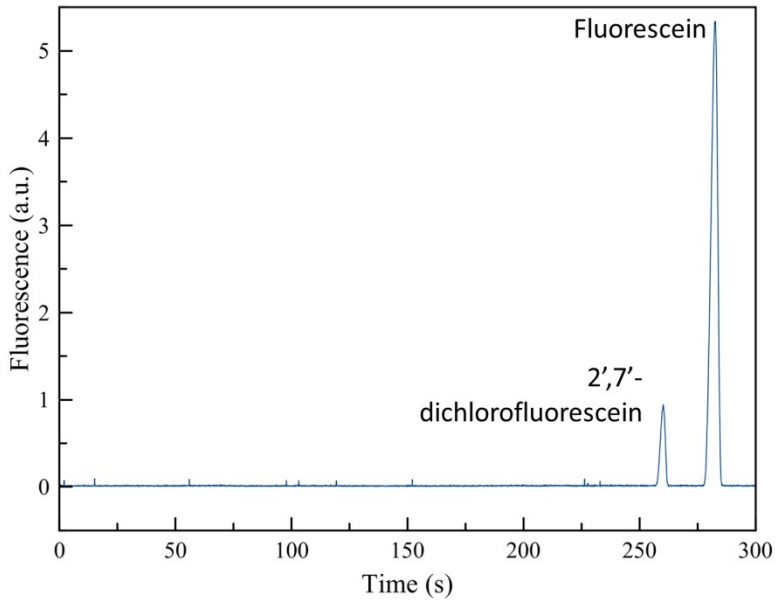
Micrograph of the PDMS channel sealed on to the end of the capillary. The channel is sealed so that the edge of the channel lines with the edge of the inner diameter of the capillary to avoid any dead volume.

Figure S-3.



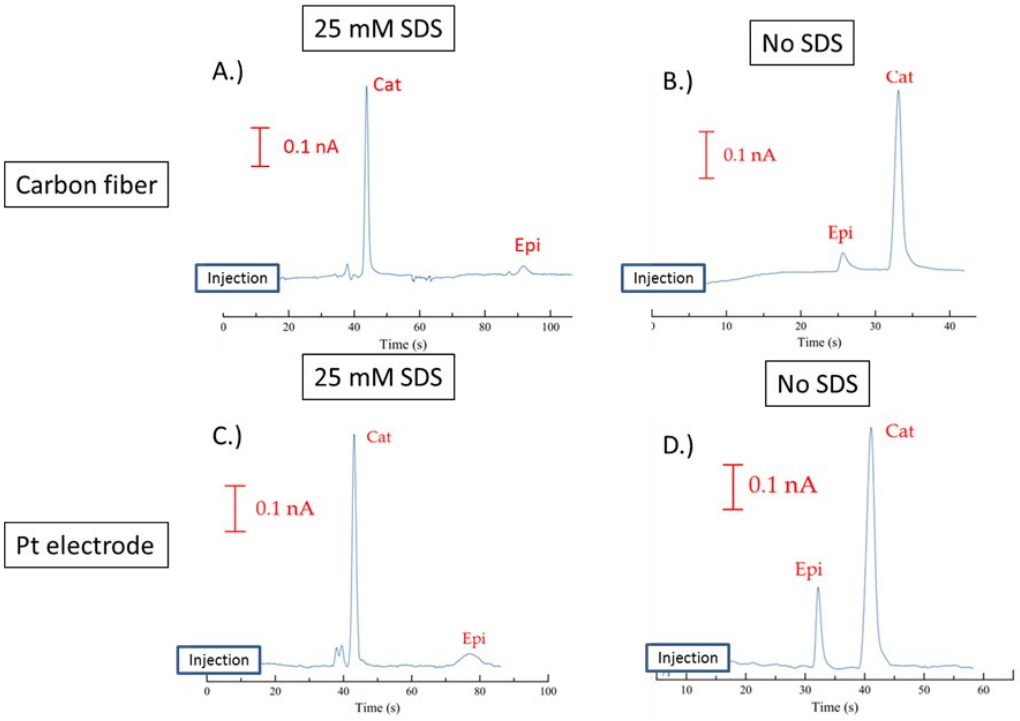
A.) Electropherogram showing the downstream detection of a 1.9 nL plug of fluorescein in the serpentine chip and the device integrated with a capillary loop. Electrophoresis was done in 25 mM boric acid (pH=9.2) and a field strength of 330 V/cm. Serpentine data is shown in green, and the integrated loop data is shown in red. B.) Bar graph showing the decrease in the migration time of fluorescein with a C.) decrease in the width at half height when using the integrated loop (Error bars represent standard error of the mean).

Figure S-4



Electropherogram of fluorescence detection of fluorescein and 2',7'-dichlorofluorescein. Analytes were separated in boric acid buffer (pH=9.2) with a field strength of 330 V/cm. For a 1.0 nL injection up to 65,900 plates and 39,800 plates were achieved for 2',7'-dichlorofluorescein and fluorescein, respectively.

Figure S-5.



Electropherograms showing the electrophoretic separation with the embedded capillary approach and electrochemical detection of catechol and epinephrine with and without 25 mM SDS using a 33 µm carbon fiber electrode (A and B) and a 25 µm Pt electrode (C and D). The buffer was 25 mM TES (pH=7.4) This comparison was done to analyze the reason for to relative decrease in signal strength when comparing epinephrine to catechol, dopamine, and norephinephrine in the separations utilizing a carbon fiber and SDS above the critical micelle concentration (CMC) (see Figure 4C). The elution order of the analytes is changed due to the 25 mM SDS being above the CMC with the epinephrine being more retained by the SDS at this concentration (as compared to catechol). It is likely that the epinephrine is being slightly masked from the detection electrode through an increase in interaction with the micelle. The 33 µm carbon fiber electrode also appears to have a decrease in redox activity for epinephrine when compared to the 25 µm Pt electrode as well.